UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/010,963	11/09/2001	Chu-Fei Chang	ARC002US	5685

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PATENT LAW OFFICES OF DAVID MILLERS
6560 ASHFIELD COURT
SAN JOSE, CA 95120

EXAMINER
STREGE, JOHN B

ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 10/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

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John B. Strege</td><td rowspan="2">Art Unit
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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>20 July 2005</u>.

2a)☒ This action is **FINAL.**   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle,* 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-7,9-19 and 28-39</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-7,9-19 and 28-37</u> is/are rejected.

7)☒ Claim(s) <u>38 and 39</u> is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

Response to Amendment

1.   The amendment received 7/20/05 has been entered in full.

Response to Arguments

2.   Applicant's arguments filed 7/20/05 have been fully considered but they are not

persuasive. Specifically the Applicant argues for claim 1 that, "Niem fails to disclose or

suggest using a background containing separated marks". Examiner respectfully

disagrees. In figure 1 part (a) there is disclosed the calibration pattern which forms the

background for the object and as labeled contains markers in each quadrant (paragraph

directly under figure 1 on page 174).

Applicant argues for claim 16 that, "Niem fails to disclose or suggest shape

reconstruction using transformations from three-dimensional coordinates to two-

dimensional coordinates." Examiner respectfully disagrees. Niem discloses that a

camera model, which is suited for 3D reconstruction applications, is the "cahv"-model

(first paragraph of section 3.3). Figure 9 discloses the transformation of real world points

(thus three-dimensional points) into two-dimensional image points in the cahv-model.

The volume of the cahv-model is approximated (therefore identified) using a triangular

mesh (as seen in figure 11). Furthermore as described in the texture mapping section,

by using the cahv camera parameters the vertices of a surface triangle are projected

into the camera plane with the original image and the clipped rectangular image part

containing the projected triangle is defined as texture map (thus identifying the volume

of the object as containing the points that the transform maps onto the silhouette of the

object).

For claim 28, the Applicant uses the same arguments used for claim 1, thus the

same response to the argument used for claim 1 applies to claim 28.

Claim Rejections - 35 USC § 102

3.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.   Claims 1,5-7,9-10,14,16-19, and 28-30 are rejected under 35 U.S.C. 102(b) as

being anticipated by Niem et al. in the IEEE published article *Automatic Reconstruction*

of 3D Objects Using a Mobile Monoscopic Camera (as cited in the Information

Disclosure Statement, hereinafter "Niem").

Regarding claim 1, Niem discloses an image processing method comprising:

analyzing a plurality of images of an object on a background that contains a plurality of

separated marks, (2nd paragraph of the introduction page 173, further seen in figure 1

page 174 and paragraph directly under figure 1, the identified marks are separated from

the object in the image as seen in figure 1) wherein for each image, analyzing

comprises: analyzing the image to identify one of the marks from among a plurality of

marks in a background of the object (first paragraph of section 3, paragraph under

figure 1 on page 174, as seen in figure 1 the marks are in the background); identifying

locations of a plurality of calibration points on the mark identified (2nd paragraph of

section 3.2 on page 175); and using the calibration points in determining camera

parameters for the image (1st paragraph of section 3); and generating a three-

dimensional model of the object from the images and the camera parameters

determined from the images (see at least the abstract and section 4).

Regarding claims 5-6, Niem discloses setting the object in an area enclosed by

the calibration pattern (as seen in figure 1). As the calibration pattern is defined on a

plane this can be read as a sheet.

Regarding claim 7, Niem discloses allowing for free movement of the camera and

an independent choice of focus (2nd paragraph from the bottom of the 2nd column on

page 173).

Regarding claim 9, Niem discloses determining a transform from three-

dimensional coordinates to two dimensional coordinates as seen in figure 9.

Regarding claim 10, Niem discloses identifying a silhouette of an object(as seen

in figure 10); applying the transform for the selected image to three-dimensional

coordinates of points from a candidate volume and constructing an approximate volume

of the object from the points that the transform maps from the candidate volume on to

the silhouette of the object in the selected image (sections 4.1 and 4.2 on pages 177-

178).

Regarding claim 14, Niem discloses approximation the volume model using a

triangle mesh (as seen in figure 11).

Regarding claim 16, Niem discloses analyzing a set of images containing an

object and a background (already discussed above) to identify for each image a

silhouette of an object and locations in the image of pattern points in the background (1st

paragraph of section 4.1); for each image, using the locations of the pattern points to

determine a transform from three-dimensional coordinates to two-dimensional

coordinates in the image and transforming three-dimensional coordinates of a set of

points in a candidate volume to the two-dimensional coordinates of a first of the images

(section 3.3 and figure 9 on page 176); and identifying an approximate volume of the

object as containing the points that the transform maps onto the silhouette of the object

in the first of the images (as seen in figure 11).

Regarding claim 17, Niem discloses approximating the volume model by using a

triangle mesh (as seen in figure 11).

Regarding claim 18, Niem discloses texture mapping in section 4.2 on page 178.

Regarding claim 19, Niem discloses that the calibration and reconstruction is

carried out for each of the multiple input images (section 6).

Regarding claim 28, Niem discloses a reconstruction engine (section 4)

comprising an extraction unit capable of processing an image of an object on a

background containing a plurality of marks that are separated from each other, wherein

the processing includes identifying one of the marks that is separated from the object in

the image (this limitation was discussed above) extracting a silhouette of the object and

determining locations of calibration points on the mark identified (as seen in figure 10

and two paragraphs following figure 10) a volume generator that receives the locations

from the extraction unit, determines a transform for the image, and determines three-

dimensional coordinates of points on a surface of the object from the transform and the

silhouettes (summary section on pages 179-180); and a reconstruction unit that

constructs a three-dimensional model of the object from the three-dimensional

coordinates of the points on the surface of the object (section 4.1 on page 177).

Regarding claim 29, Niem discloses that the algorithms used for the silhouette

extraction and volume generator are software (paragraph under figure 10 as well as the

abstract).

Regarding claim 30, as the reconstruction engine is on software it is executable

on a computer.

Claim Rejections - 35 USC § 103

5.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

6.   Claims 2-4, 11-13, 15, 31-32, and 35-37 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Niem et al. in the IEEE published article *Automatic*

Reconstruction of 3D Objects Using a Mobile Monoscopic Camera (as cited in the

Information Disclosure Statement, hereinafter "Niem").

Claims 2-4 are dependent on claim 1 (anticipated by Niem) and include the

further limitation that the mark comprises a first rectangular segment having corners that

are among the calibration points. Niem discloses that the position markers are inside

rectangular quadrants (figure 1 and paragraph directly following it). Niem does not

explicitly disclose that the corners of the mark are among the calibration points.

However Niem does disclose that for the identification of the calibration points, at least

one position marker and its two neighboring line segments have to be detected (second paragraph of section 3.2).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the corners of the quadrants as calibration points. Applicant has not disclosed that using the corners provides an advantage, is used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with Niem's invention because it is calibrating the camera using calibration points that are in the center of the quadrant, thus the end result of calibration is the same.

Therefore, it would have been obvious to combine using the corners of the calibration marks with Niem to obtain the invention as specified in claims 2-4.

Claims 31-32 disclose similar limitations to claims 2-4, thus the same arguments applied for claims 2-4 apply equally to claims 31-32.

Claims 11-12 describes determining whether or not the model is suitable and if it is unsuitable performing the steps of claims 9-10 until it is suitable. Niem does not explicitly disclose determining whether or not the model is suitable and repeating the steps performed until it is suitable but it would be obvious to do so since it is well known that the more data that for a passive three dimensional model to be suitable requires a number of input images, and if the model is unsuitable then more input images should be added. The motivation for doing so would be to have a model of sufficient quality for whatever purposes necessary.

Regarding claims 13 and 15, Niem discloses analyzing the image using software that distinguishes the silhouette of the object from the background (as seen in the second column of page 177). Niem does not explicitly disclose providing a user with a method for modifying of the silhouette. It is well known in the art of image processing to allow a user to modify an image, thus the examiner declares official notice. It would be obvious to one of ordinary skill in the art to modify a silhouette because images may arise in which the computer can not achieve the same quality of recognition of the silhouette as the human eye, thus the user would be able to judge this and make the necessary improvements.

Regarding claim 35, Niem discloses selecting the candidate volume based on a position of the silhouette relative to the pattern points in one of the images (first paragraph of section 4.1, and the two paragraphs under figure 10).

Regarding claim 36, the object in figure 10 is three-dimensional thus it has points with coordinates x,y, and z which are within a corresponding range.

Regarding claim 37, the volume model surface further triangles are constructed at each open edge until the whole volume model is covered with a mesh (last paragraph on page 177).

7.   Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Niem et al. in the IEEE published article *Automatic Reconstruction of 3D Objects Using*

a Mobile Monoscopic Camera (as cited in the Information Disclosure Statement,

hereinafter "Niem") and further in view of Eylon USPN 5,867,590.

Niem does not explicitly disclose using asymmetrical marks to determine the

orientation of a reference axis. Niem uses symmetrical marks to determine the

orientation. However it is well known to use asymmetrical marks to determine the

orientation of a reference axis. Eylon discloses determining the directions of the grid

lines relative to the directiona of a reference coordinate system, detecting an

asymmetrical directional feature, its orientation with respect to the directions of the grid

lines and the distance of the asymmetrical feature from a geometrical center of the

surface being known (see the abstract).

At the time of the invention it would have been obvious to one of ordinary skill in

the art to combine Niem and Eylon to use asymmetrical marks to identify the reference

axis. The motivation is that Eylon discloses that asymmetrical marks are useful for

position location. Thus it would have been obvious to one of ordinary skill in the art to

combine Niem and Eylon to obtain the invention as specified in claims 33-34.

Allowable Subject Matter

8.   Claims 38-39 are objected to as being dependent upon a rejected base claim,

but would be allowable if rewritten in independent form including all of the limitations of

the base claim and any intervening claims.

Conclusion

9.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to John B. Strege whose telephone number is (571) 272-

7457. The examiner can normally be reached on Monday-Friday between the hours of

8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS

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